

LETTERS TO THE EDITOR.

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Eclipse Photography.

THE writer has obtained results in photography which seem to have an important bearing on the work which should be undertaken in future eclipses.

It is well known that photographic plates exposed in some eclipses have developed no trace of an image of the sun. The astronomer has even been subjected to the mortifying suggestion that he had forgotten to uncup his camera. It is not difficult to reproduce such results at any time by simple over-exposure. In eclipse photography, where it is sought to get the most delicate of details in an object of the most delicate character, the methods now used are hedged in by very peculiar limitations. It requires a very appreciable time to secure delicate details, and, nevertheless, if this time is made too great the plate will fog. The developer must then be given restraining properties, which cause a loss of the very details we are seeking to secure.

In a paper recently published by the Academy of Science of St. Louis, the writer has shown that a plate which, on account of over-exposure will develop as a zero plate in a dark room, will develop as a positive in a light room. The paper contains a half-tone reproduction of a positive obtained by a camera exposure of one minute, and developed within a few inches of a 16-candle incandescent lamp. The plate was an "instantaneous" Cramer plate. Since that time the same results have been reached by first opening up the plate holder and exposing the film to the lamp light until it is all converted into the zero condition. If covered with an opaque punched stencil, no trace of the design will appear on the film when developed in the illuminated bath. The slide is then closed and the plate afterwards exposed in the camera in the usual way. Such a plate cannot be over-exposed in any reasonable time. It may be exposed for a minute or for four hours to a brilliantly-lighted landscape, and the most superb results can be obtained. There is no restraining developer needed. The tendency to fog when the exposure is too short is corrected by taking the developing bath nearer to the light. It seems probable that on very short exposures it might sometimes be advantageous to use a developer which will yield a positive with an under-exposed plate. In the two eclipses of long totality which are now approaching, this method seems to promise very valuable results, and the attention of those who will have the work in charge is earnestly directed to this matter. The results described have been reached but recently, and there is need of preliminary experimenting by any one who wishes to avail himself of these methods.

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The Action of Water Upon Glass.

It is a matter of too frequent observation in India that lenses of optical instruments are liable to serious injury from atmospheric influences. This very often takes the form of injury to the Canada balsam cementing the two lenses of achromatic combinations together; but in other cases, it is due to the solvent action of water on the surface of the glass. As this is a matter of importance necessitating the re-grinding of the lens for its correction, I have thought that the following observations may be of interest and of value to optical instrument-makers, especially as it appears that only particular kinds of glass are attacked in this way. If that is so, it should be possible to avoid using glass of that particular composition; or the edges of the combined lenses may be covered with a coating of cement or varnish so as to prevent moisture getting in between them, and in such a way that it could easily be removed when desired.

My attention was first drawn to some cases of articles of domestic glassware being attacked by water standing in them for some time, and these are recorded to show that a solvent action does take place. The first case that I noticed was that of a cut wine glass which was used—or misused—to hold a few cut flowers. On seeing it dry on one occasion, I noticed it had a dull matt appearance, which I thought was simply a deposit. On examination, however, I found that the surface of the glass had been eaten into up to the level of the water usually put into it.

The next case was that of glass finger-bowls, in which the servants kept water ready for use. These were similarly attacked up to the level of the water. The next was a more remarkable case. A couple of decanters, not required for use, had evidently been washed and drained, more or less, but not dried; possibly during the hot season. The moisture remaining inside had become deposited on the inner surface in droplets, as, indeed, may frequently be seen, and had been standing so for some time. When dried for use the surface was found to be eroded, giving a pattern precisely similar to that formed by condensed moisture: leaving no doubt as to its cause.

Here we have, then, a case of pure water attacking the surface of glass when allowed to stand for some time. Since then, being on the alert, I have met other cases, including some of perfectly new glass articles eroded in like manner, which, without their history, it is impossible to account for.

Now for two instances of physical apparatus being attacked and spoiled by this action. The first noticed was a Newton's Rings apparatus. In this case the two discs of glass were equally attacked, and so much so that the combination was of a dense matt appearance. On opening it out, the discs were found to be firmly adhered, and on inserting a knife edge between the discs and giving a sharp tap on the back to separate them, an irregular piece about $1\frac{1}{4}$ inch long came from one adhering to the other. The two had thus grown together, and at the junction was actually stronger than in the mass of the glass.

The next was a more serious case, being the object lens of a $3\frac{1}{2}$ inch telescope from a well-known London firm of optical instrument-makers. In this case, the convex lens was badly corroded on its inner surface, though the adjacent face of the concave lens was quite clear. Here we see the difference in action in the case of two different kinds of glass. This, however, would help us little if all kinds of crown glass (of which the convex lens is made) were similarly attacked. But this is not the case, and it is a point of importance to opticians to ascertain what particular kinds of crown glass used in achromatic combinations are liable to this action, and to avoid using them. Of a fairly large number of achromatic combinations I have in the College Laboratory, this is the only one that has been affected, though all are exposed to the same influences, while some belong to old pieces of apparatus. The particular telescope was purchased about six years ago, and the damage took place in one season when it was not much used. Since then I have from time to time opened out the lenses and have frequently found a layer of moisture between them; in one case, of a commoner piece of apparatus in which the lenses did not fit closely, a complete drop of water was collected, the diameter of the lens being only $1\frac{1}{2}$ inch; and in a Soleil's saccharimeter, clear through vision is obscured by moisture collected and condensed on the surfaces of the lenses in one of the adjusting pieces, which it is very difficult to open out to clean.

All this shows that moisture does collect in the form of water between such layers of glass, and the pattern of the eroded portion of the telescope lens, together with the instances of the action of water on the domestic glass goods mentioned above, leave no doubt that it was moisture alone that caused the damage in this case, although it was not actually seen. I need hardly say that, in both the Newton's Rings apparatus and the telescope lens, the exposed surfaces were perfectly clear and unacted upon.

The causes of moisture collecting in this way would appear to be the excessive moisture in the air for many months in the year, the hygroscopic nature of the glass, and capillary action between the surfaces; while the apparently marked action of water on glass here noticed is probably due to the long-continued higher temperature. It is possible, however, that the above phenomena may not be as new or unusual as they appear to be to me, and that many others could give like experiences.

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Dacca College, Dacca, East Bengal, June 12.

THE TOTAL SOLAR ECLIPSE AS OBSERVED BY THE SMITHSONIAN EXPEDITION.

WADESBORO, in Northern Carolina, was the station selected by the Smithsonian Institution for observing the total solar eclipse of May 28 last. The chances of fine weather at eclipse time were about eight to one, and it is satisfactory that on eclipse day the sky was cloudless and the air clearer than on the average.